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Nadeem Ahmed

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EXAMINER

WARE, CICELY Q

ART UNIT

PAPER NUMBER

2634

6

DATE MAILED: 07/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/865,238

Applicant(s)

AHMED ET AL

Examiner

Cicely Ware

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 May 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-9,11,12,13,15-20,22,23 is/are rejected.
- 7) ☒ Claim(s) 3,10,14 and 21 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 May 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Drawings***

1. Examiner suggests applicant use a uniform font for all drawings.
2. Figure 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawing sheets are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.
3. This application has been filed with informal drawings, which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

### ***Specification***

4. The abstract of the disclosure is objected to because
  - a. Pg. 22, line 16, examiner suggests applicant delete this line.Correction is required. See MPEP § 608.01(b).
5. The disclosure is objected to because of the following informalities:

a. Pg. 3, line 1, applicant uses the phrase "values indicated the transmitted". Examiner suggests using "values in indicate the transmitted" for clarification purposes. Appropriate correction is required.

6. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8. Claims 1, 2, 4, 6-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Liu et al. (US Patent 6,754,261).

(1) With regard to claim 1, Liu et al. discloses in (Fig. 8) a communications receiver (830) that comprises: an analog-to-digital converter (831) that samples a DMT (discrete multi-tone) signal to obtain a digital receive signal; a transform module (833) coupled to the analog-to-digital converter and configured to determine amplitudes associated with frequency components of the digital receive signal; and a detection module (832) configured to determine a channel symbol from the amplitudes while

accounting for correlation between the amplitudes (col. 5, lines 42-57, col. 7, lines 32-36, 63-64, col. 8, lines 1-9, 56-61, col. 10, lines 4-16, col. 24, lines 37-67, col. 25, lines 43-47).

(2) With regard to claim 2, claim 2 inherits all the limitations of claim 1. Liu et al. further discloses wherein the detection module determines the most probable channel symbol given the amplitudes determined by the transform module (col. 24, lines 37-67, col. 25, lines 1-10, 37-67).

(3) With regard to claim 4, claim 4 inherits all the limitations of claim 1. Liu et al. further discloses wherein the detection module determines the channel symbol that corresponds to a matrix product of a matrix  $M$  and a vector of amplitudes from the transform module, wherein the matrix  $M$  minimizes a square of an expected error between the channel symbol and valid channel symbols (col. 8, lines 23-64).

(4) With regard to claim 6, claim 6 inherits all the limitations of claim 1. Liu et al. further discloses in (Fig. 8) a time domain equalizer (832) that operates on the digital receive signal to maximize a percentage of impulse response energy in a predetermined interval (col. 6, lines 57-60, col. 7, lines 63-65, col. 8, lines 17-20).

(5) With regard to claim 7, claim 7 inherits all the limitations of claim 1. Liu et al. further discloses in (Fig. 8) a cyclic prefix remover (832) that removes prefixes from the digital receive signal, each prefix being associated with a respective channel symbol (col. 7, lines 63-67).

(6) With regard to claim 8, claim 8 inherits all the limitations of claim 1. Liu et al. further discloses in (Fig. 8) an error correction code decoder (835) that decodes channel symbols received from the detection module (col. 7, lines 64-67, col. 8, lines 9-11).

(7) With regard to claim 9, claim 9 inherits all the limitations of claim 1. Liu et al. further discloses in (Fig. 8) the transform module (833) performs a fast Fourier Transform (FFT) on the receive signal in each channel symbol interval (col. 5, lines 55-57, col. 8, lines 1-4).

9. Claims 11 is rejected under 35 U.S.C. 102(e) as being anticipated by Marchok et al. (US Patent 6,118,758).

With regard to claim 11, Marchok et al. discloses a method of receiving OFDM (orthogonal frequency division multiplexing) modulated data, wherein the method comprises: determining a set of frequency component amplitudes associated with a channel symbol interval of a receive signal; and determining a channel symbol associated with the set of frequency component amplitudes while accounting for correlation between the amplitudes (col. 4, lines 1-23).

### ***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US Patent 6,754,261) as applied to claim 1, in view of Dowling (US Patent 6,597,745).

With regard to claim 5, claim 5 inherits all the limitations of claim 1 above. Liu et al. discloses wherein the detection module includes: a subtraction module that removes trailing intersymbol interference from the output of the transform module to obtain ISI-corrected frequency component values (col. 2, lines 50-55, col. 7, lines 65-67).

Liu et al. does not explicitly disclose a subtraction module. However Liu et al. discloses wherein a time-domain equalizer inherently subtracts ISI by shortening the impulse response of the channel by using a CP remover so that the DMT symbols are obtained.

However Liu et al. does not discloses a decision unit that determines a matrix product of a matrix M and a vector of ISI-corrected frequency component values to obtain the channel symbol; and a feedback module that determines a matrix product of a matrix T and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module.

However Dowling et al. discloses a decision unit in (Fig. 1 (105, 130), Fig. 5 (505, 565)) that determines a matrix product of a matrix M and a vector of ISI-corrected frequency component values to obtain the channel symbol; and a feedback module that determines a matrix product of a matrix T and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module (col. 4, lines 1-2, 37-45, col. 5, lines 54-55)).

Therefore it would have been obvious to one of ordinary skill in the art to modify Liu et al. to incorporate a decision unit that determines a matrix product of a matrix  $M$  and a vector of ISI-corrected frequency component values to obtain the channel symbol; and a feedback module that determines a matrix product of a matrix  $T$  and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module in order to round the reduced values to the nearest constellation point in each dimension (Dowling, col. 5, lines 55-57).

12. Claims 12, 13, 15-20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marchok et al. (US Patent 6,118,758) as applied to claim 11, in view of Liu et al. (US Patent 6,754,261).

(1) With regard to claim 12, claim 12 inherits all the limitations of claim 11 above. However Marchok et al. does not disclose wherein said determining a channel symbol includes: identifying a channel symbol that is most probably correct given the set of frequency component amplitudes.

However Liu et al. discloses wherein said determining a channel symbol includes: identifying a channel symbol that is most probably correct given the set of frequency component amplitudes (col. 24, lines 37-67, col. 25, lines 1-32).

Therefore it would have been obvious to one of ordinary skill in the art to modify Marchok et al. to incorporate wherein said determining a channel symbol includes: identifying a channel symbol that is most probably correct given the set of frequency



component amplitudes in order to provide the best Nyquist rate sequence to the equalizer (Liu et al., col. 24, lines 66-67).

(2) With regard to claim 13, claim 13 inherits all the limitations of claim 11. Liu et al. further discloses wherein said determining a channel symbol includes: for each frequency component: calculating a weighted sum of frequency component amplitudes that minimizes expected error energy of the frequency component (col. 8, lines 46-62).

(3) With regard to claim 15, claim 15 inherits all the limitations of claim 11. Liu et al. further discloses wherein said determining a channel symbol includes: subtracting intersymbol interference from the set of frequency component amplitudes to obtain an ISI-corrected set of frequency component amplitudes; determining a product of a matrix M and the ISI-corrected set of frequency component amplitudes to obtain the channel symbol; and determining a product of a matrix T and the channel symbol to obtain the intersymbol interference in a subsequent set of frequency component amplitudes (col. 2, lines 50-55, col. 7, lines 65-67, col. 12, lines 25-58, col. 15, lines 62-67, col. 16, line 1).

(3) With regard to claim 16, claim 16 inherits all the limitations of claim 11. Liu et al. further discloses processing the receive signal to shorten the effective channel impulse response before performing said determining a set of frequency component amplitudes (col. 8, lines 14-22).

(4) With regard to claim 17, claim 17 inherits all the limitations of claim 11. Liu et al further removing a prefix from each symbol interval of the receive signal before

performing said determining a set of frequency component amplitudes (col. 7, lines 64-67, col. 8, lines 1-9).

(5) With regard to claim 18, claim 18 inherits all the limitations of claim 11. Liu et al. further discloses in (Fig. 8) determining a set of frequency component amplitudes includes: converting the receive signal into digital form (831); and performing a fast Fourier Transform (833) on the digital receive signal (col. 5, lines 55-57, col. 8, lines 1-4).

(6) With regard to claim 19, Marchok et al. further discloses an OFDM/DMT communications system that comprises: a transmitter that transmits an OFDM modulated signal; and a receiver that receives and demodulates a corrupted version of the OFDM modulated signal, wherein the receiver includes: an analog-to-digital converter that samples the corrupted OFDM-modulated signal to obtain a digital receive signal (abstract, col. 3, lines 40-48, 60-61, col. 5, lines 38-56, 66-67, col. 6, lines 1-2, col. 17, lines 26-46).

(7) With regard to claim 20, claim 20 inherits all the limitations of claim 19. Liu et al. further discloses wherein the detection module determines the most probable channel symbol given the amplitudes determined by the transform module (col. 24, lines 37-67, col. 25, lines 1-10, 37-67).

(8) With regard to claim 22, claim 22 inherits all the limitations of claim 19. Liu et al. further discloses wherein the detection module determines the channel symbol that corresponds to a matrix product of a matrix  $M$  and a vector of amplitudes from the

transform module, wherein the matrix  $M$  minimizes a square of an expected error between the channel symbol and valid channel symbols (col. 8, lines 23-64).

13. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Marchok et al. (US Patent 6,118,758) in combination with Liu et al. (US Patent 6,754,261) as applied to claim 19, in further view of Dowling (US Patent 6,597,745).

With regard to claim 23, claim 23 inherits all the limitations of claim 19. Marchok et al. in combination with Liu et al. disclose all the limitations of claim 19 above. However Marchok et al. in combination with Liu et al. do not disclose a decision unit that determines a matrix product of a matrix  $M$  and a vector of ISI-corrected frequency component values to obtain the channel symbol; and a feedback module that determines a matrix product of a matrix  $T$  and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module.

However Dowling discloses a decision unit in (Fig. 1 (105, 130), Fig. 5 (505, 565)) that determines a matrix product of a matrix  $M$  and a vector of ISI-corrected frequency component values to obtain the channel symbol; and a feedback module that determines a matrix product of a matrix  $T$  and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module (col. 4, lines 1-2, 37-45, col. 5, lines 54-55).

Therefore it would have been obvious to one of ordinary skill in the art to modify the inventions of Marchok et al. in combination with Liu et al. to incorporate a decision unit that determines a matrix product of a matrix  $M$  and a vector of ISI-

corrected frequency component values to obtain the channel symbol; and a feedback module that determines a matrix product of a matrix T and the channel symbol from the decision unit to provide the trailing intersymbol interference to the subtraction module in order to round the reduced values to the nearest constellation point in each dimension (Dowling, col. 5, lines 55-57).

***Allowable Subject Matter***

14. Claim 3, 10, 14 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

15. The prior art made record of and not relied up on is considered pertinent to applicant's disclosure:

a. Sandberg et al. (Overlapped Discrete Multitone Modulation for High Speed Copper Wire Communications, IEEE) (cited by applicant).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cicely Ware whose telephone number is 703-305-8326. The examiner can normally be reached on Monday – Friday, 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 703-305-4714. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

*Cicely Ware*

cqw  
July 18, 2004



STEPHEN CHIN  
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